
Laboratory Beryllium Analyses in the DOE Complex - Where We Are and Where We Need to Go

**Mike Brisson, Paula Cable-Dunlap, Amy
Ekechukwu and Chuck Shick
Westinghouse Savannah River Co.**

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Beryllium Issues

- Why is it important?
- Where are we today?
- What is being done now?
- Where do we go from here?



Why Is It Important?

- Exposure to Be (skin or inhaled) can lead to:
 - Sensitization (mechanisms not fully understood)
 - Chronic Beryllium Disease (CBD) - lung disease similar to asbestosis, incurable
 - Exposure mechanisms not fully understood
- Beryllium at DOE sites in various forms
 - Metal, oxide, alloys
 - Some forms more difficult to digest than others
- Industrial Hygiene issue, but IH depends on laboratory analyses of Be swipes and filters
- Legal/financial issues for DOE and contractors
- Increasing level of publicity

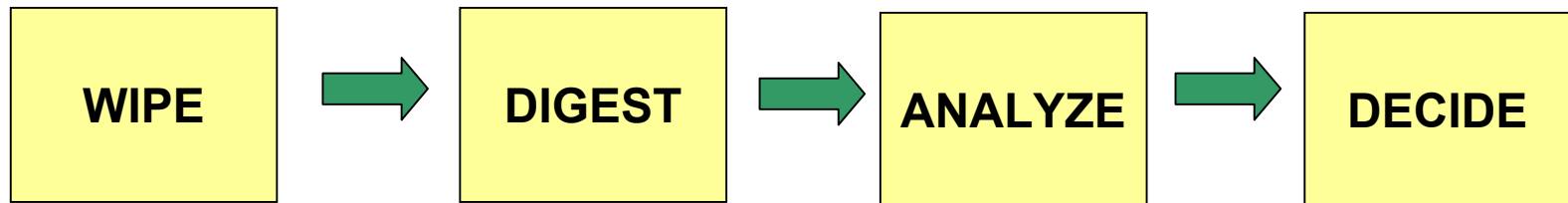
Why Is It Important?

DOE Beryllium Rule (10 CFR 850, effective 1/7/2000)

- Minimize levels of/potential for exposure to beryllium (Be)
- Establish CBD prevention programs & medical surveillance
- Labs must be accredited by American Industrial Hygiene Assn. (AIHA) or demonstrate QA equivalent to AIHA accreditation
- Measure Be at or below free release limit
 - 0.2 micrograms per m³ (air) or per 100 cm² (swipe)
 - All forms of Be
 - Removable contamination
 - Items released to public or DOE non-beryllium areas
- OSHA Rulemaking may further lower limit within next three years
- Issue for DOE, commercial (Brush-Wellman), British sites, and others

Where Are We Today?

- Lab analysis required for personnel samples and material release
- Different DOE sites follow different protocols
- AIHA accreditation does not equal consistency
 - AIHA recognizes NIOSH and EPA methods
 - Many methods generic, not intended for ultra-low-level Be
- Involves IH and analytical personnel who speak different languages



Where Are We Today?

Issues with Sampling (Wipes/Filters)

- Wipes or swipes?
- Wet or dry?
- Wipe/filter medium? (Ghost wipes, Whatman filters, etc.)

Issues with Sample Preparation (Digestion)

- NIOSH 7102, NIOSH 7300, EPA SW-846, or other permutations?
- How robust does it need to be?
 - BeO: Present? High-fired? At what temperature?
- Glassware or plastic-ware?
- Hold time between digestion and analysis?

Where Are We Today?

Instrumentation Options (ICP-ES, GFAA, ICP-MS)

Issues with Detection Limits

- Methodology: EPA, IUPAC, et. al.
- Terminology: IDL, MDL, PQL, et. al.

Issues with Quality Control

- Calibration
- Check samples: how close to the detection limit?
- Matrix-matching (blanks and/or spikes)
- Round robins (Be acetate isn't enough)

Where Are We Today?

Issues with Spectral Interpretation

- Which line(s) to use? How many to report?
- Background correction
- Interelement correction
- Interferences (Al, Cu, Fe, Ni, W)

Legal/Regulatory Issues

- Accreditation vs. equivalence
- OSHA rulemaking (could impose its own analytical method?)
- Defensible data packages

What Is Being Done Now?

Industrial Hygiene Community

- Wants field instrumentation for (near) real-time results
- Ten attempts from various vendors have resulted in zero validated instruments
- Technology Assessment Team formed to study issue - primarily IH with one analytical member
- Recommended 3-5 year effort to develop within DOE complex
- SRTC developing a field instrument for swipes (12-24 mo.)
- IH “working groups” not connected adequately with analytical (at some sites, don’t recognize they may have a problem)

What Is Being Done Now?

Analytical Community

- Proposed BeO standards from Y-12
- AIHA proficiency standards (Be acetate)
- Be session at ACS National Meeting, Spring 2004
- Attempts to collect data from complex produced limited results

Savannah River Site

- Published lessons learned
- Ad hoc group of IH and analytical personnel
- Be analyzed at two locations
 - 735-B for cold samples (AIHA accredited)
 - 773-A for rad-contaminated samples (equivalent but not accredited)
- Different ICP-ES instruments at each location
 - Differences in interferences and spectral interpretation
 - Ad hoc group pursuing continuous improvement of SRS Be analytical capabilities



Where Do We Go From Here?

Need DOE Beryllium Analytical Working Group

- Sponsorship: DOE Analytical Managers
- Collect info from all DOE sites with beryllium

DOE Site	Wipe Media	Digestion Method(s)	Instrument used	Lower Re- porting Limit	Line(s) Used	IEC/Interfer. Correction
SRS	Wet ghost	Mod SW846	ICP-ES			
Y-12	Dry	Sulfuric	ICP-ES			
LANL (BTF)	?	?	ICP-ES			
LLNL	Dry	NIOSH 7102	ICP-ES			

**Example Table Only
to show data needs**

Where Do We Go From Here?

DOE Beryllium Analytical Working Group (cont.)

- Interface with IH customers
- Develop technical recommendations
- Develop data package recommendations
- Develop consistent terminology
- Improve consistency of methodologies

Decision Makers (DOE Analytical and/or IH Managers):

- Identify funding needed for working group, studies for method development/improvement
- Approve/implement recommendations

Bottom-Line Needs:

- Worker protection
- Defensible data



Conclusions

- Analysis of Be is an urgent concern across DOE complex and beyond
- Legal/regulatory implications
- Technical issues (wipes, media, digestion, instrumentation, QC, data interpretation)
- Insufficient interface with IH customers
- Need support from DOE Analytical Managers

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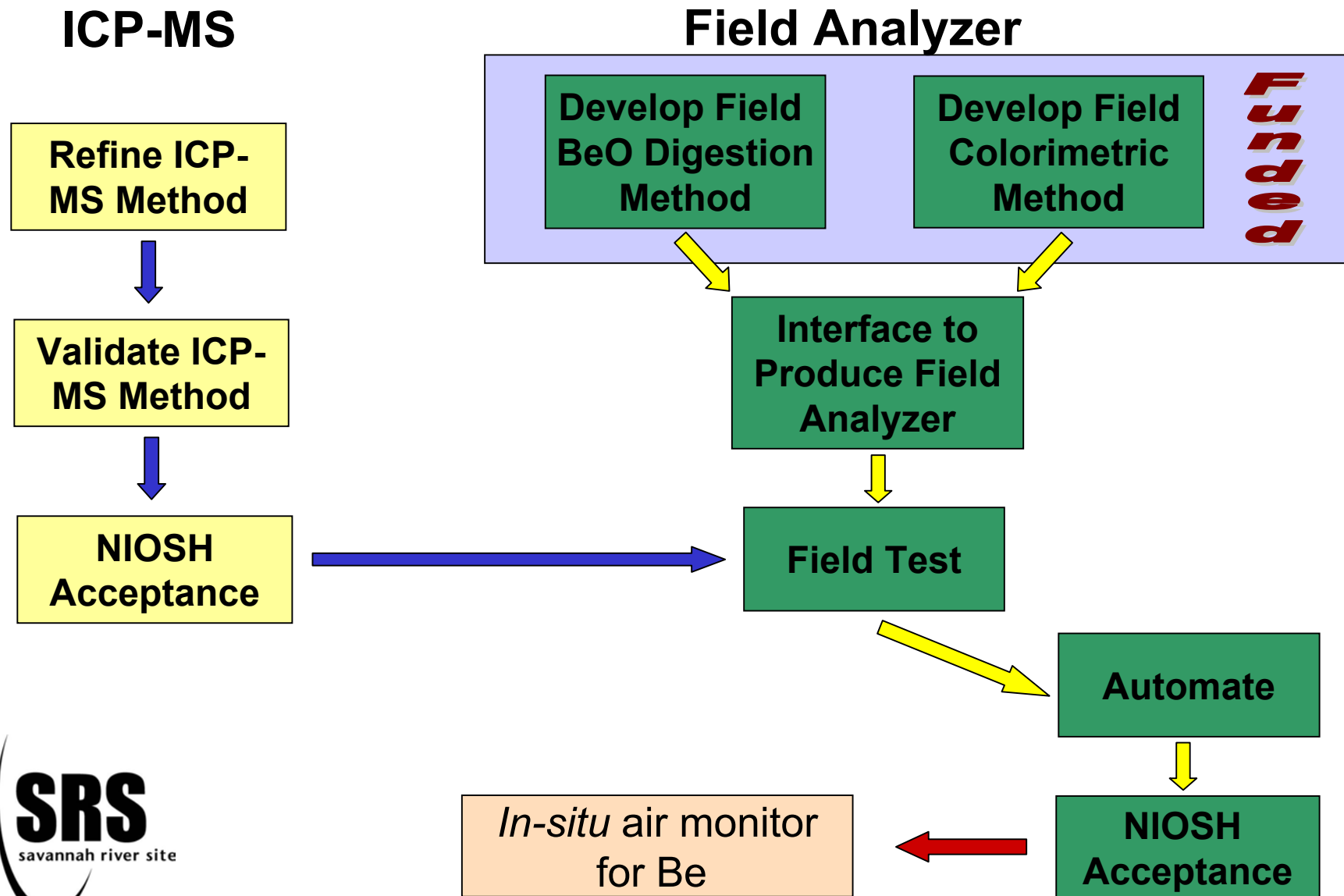
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Hip Pocket Stuff

Remaining slides come from other presentation(s) and may be useful as “hip pocket” info

Path Forward



DOE Be Rule

SUMMARY: The Department of Energy (DOE) is today publishing a final rule to establish a chronic beryllium disease prevention program (CBDPP) to reduce the number of workers currently exposed to beryllium in the course of their work at DOE facilities managed by DOE or its contractors, minimize the levels of, and potential for, exposure to beryllium, and establish medical surveillance requirements to ensure early detection of the disease. This program improves and codifies provisions of a temporary CBDPP established by DOE directive in 1997.

EFFECTIVE DATE: This rule is effective January 7, 2000.